

Media use, cancer knowledge and lifestyle choices: a cross-sectional analysis

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Background: Both media use and cancer knowledge have been identified as important predictors of a healthy lifestyle. However, little is known about the interplay between these two variables, and about differences between cancer diagnosed and non-diagnosed consumers of media and knowledge. This study investigated the relationship between media use (television and internet exposure) and lifestyle choices of cancer diagnosed and non-diagnosed individuals, and looked at the influence of cancer knowledge on this relationship. **Methods:** A cross-sectional, quantitative survey (the Leuven Cancer Information Survey) was administered to 621 cancer diagnosed and 1387 non-diagnosed individuals, aged 16–88 years old in Flanders (Belgium). Bivariate analyses, hierarchical linear regression analyses and advanced moderation and mediation analyses were conducted. **Results:** Internet exposure was not a predictor of lifestyle choices. Television exposure, however, was a negative predictor of healthy lifestyle choices. Moreover, television exposure was a direct negative predictor of cancer knowledge, which in turn positively predicted lifestyle choices. However, no differences were found in the investigated relationships between the two subsamples. **Conclusion:** These results indicate that higher levels of television exposure coincide with less cancer knowledge and with less healthy lifestyle choices. It offers a pathway for intervention by suggesting that improving cancer knowledge through television might positively affect lifestyle choices.

Introduction

Research suggests that 4 out of 10 cancers could be prevented by healthier lifestyle choices (e.g. fruit and vegetable consumption, increased physical activity) and by early detection.^{1,2} Increased physical activity, for instance, has been linked to a decreased breast cancer risk.² Several predictors of lifestyle choices have been identified in the literature. This study will examine two communication-related predictors of lifestyle choices: media use and cancer knowledge.

One of the media most commonly associated channels with unhealthy lifestyle choices is television. Exposure to television has been linked to a more sedentary lifestyle,^{3,4} snacking,⁵ insufficient consumption of fruits and vegetables⁴ and earlier smoking onset.⁶ In comparison to television, relatively little is known about the relationship between internet use and lifestyle choices, despite the enormous amount of health information available on the internet.⁷

While television exposure is usually identified as a predictor of unhealthy lifestyle choices, knowledge has been identified as a predictor of healthy lifestyle choices.⁸ One study reported that a low level of cancer knowledge was one of the most crucial predictors of insufficient cancer screening.⁹ A study among Latin-American women found that cancer knowledge was positively associated with perceived self-efficacy for cancer screening.¹⁰ Other research also found a positive relationship between cancer knowledge and screening behaviour.¹¹

To date, the relationship between media use and cancer knowledge appears to have received relatively little attention in the literature, even though the mass media are often cited as a source from which individuals receive health and cancer information.^{7,12} Cancer information seeking in the traditional mass media, and cancer information gathered through routine media use have been positively linked with cancer knowledge.¹³ Furthermore, recent studies suggest there is an 'explosive growth in health-oriented television program content'.¹⁴ Also the internet has been identified as a potential source of cancer knowledge.¹⁵ Moreover, a national study in USA showed that 55% of the respondents indicated that

'the last time they looked for cancer information, they first looked online'.¹⁶

This study has three aims. First, to study whether and how exposure to television and the internet on the one hand, and cancer knowledge on the other hand, predict lifestyle choices (objective 1). Second, to examine whether cancer knowledge moderates (objective 2a) or mediates (objective 2b) the relationship between media use and lifestyle. Third, this study wants to determine whether the relationships found in the first two aims differed for cancer diagnosed and non-diagnosed individuals (objective 3). Having had a personal cancer history could influence levels of cancer knowledge and lifestyle choices because of personal experience with the disease.

Methods

Data collection

This study used data generated from the Leuven Cancer Information Survey (L-CIS) which was the main tool of a research project entitled 'Monitoring cancer information acquisition and effects in Flanders'. This standardized survey was completed by 621 cancer diagnosed and 1387 non-diagnosed individuals between May 2012 and January 2013 in Flanders (Belgium).

Cancer diagnosed individuals were recruited through online Dutch-speaking cancer discussion groups. In addition, all Flemish cancer self-help groups were contacted. Potential respondents were directed to an URL of the L-CIS questionnaire, or, if they preferred a paper questionnaire, this was sent to their home address, accompanied with a stamped and addressed envelope. Finally, a research assistant approached cancer patients in the oncology consultation waiting room of a large Belgian teaching hospital.

To reach a relatively large and random sample of adults of the non-diagnosed general public, a convenience sample was chosen. The survey was posted on the online learning environments of a random sample of further education centers in Flanders.

The L-CIS was approved by the Ethics Review Board of Human Sciences of the University of Leuven.

Measures

Demographics

Date of birth was recoded into a variable with the current age of respondents. Gender was recoded to 'men' (=0) and 'women' (=1). Degree was queried with a rank-order measure, ranging from 'no degree' (=0) to 'university degree' (=5).

Cancer diagnosis

The question 'Have you ever been told by a doctor that you had cancer?'^{13,17} measured whether individuals had ever received a cancer diagnosis. Furthermore, a question about indirect experience with cancer through close family members¹⁶ was asked to measure direct family history with cancer ('no' =0, 'yes' =1).

Health perception

Respondents were asked to assess their health from 'poor' (=0) to 'excellent' (=5).¹⁸ This one-item question has been shown to be a strong indicator of actual health.¹⁹

Media use

The L-CIS included questions designed for the Swedish Media Panel Program,²⁰ adapted for use in Dutch in an earlier study.²¹ Respondents were asked to estimate their average television viewing hours on weekdays, Fridays, Saturdays and Sundays on a 10-point scale (ranging from '0 h' to '5 h and more'). Respondents had to indicate viewing frequency, ranging from 'never' to 'every day/Friday/Saturday/Sunday'. The total weekly and average daily exposure of television viewing was calculated with these variables.

Internet volume was measured with the question 'How much time do you surf the internet (not for work purposes) on an average weekday/Friday/weekend day?'. Respondents were asked to provide a numerical estimate of hours and minutes. These time volumes on weekdays and on weekend days were weighted and summed to form the total weekly exposure of internet use.

Cancer knowledge index

Respondents' knowledge about cancer was queried with an index of knowledge about cancer¹³, which contained six questions about exercise, smoking risk, the daily recommended amount of vegetables and fruits, personal impact on preventing cancer, and the recognition of specific screening tests. Each item was dichotomized to 0 for an incorrect answer and to 1 for the correct answer. These six items were summed to form an index, ranging from 0 to 6, with a higher score indicating more knowledge.

Lifestyle choices index

An index of lifestyle choices was created (adapted from a previous study¹³), with questions regarding smoking, eating fruits, eating vegetables, exercising and alcohol consumption. Each item was dichotomized to 0 for the more unhealthy choice and to 1 for the healthier alternative, and was summed to form an index (ranging from 0 to 5, with a higher score indicating a better lifestyle).

Statistical analyses

In order to examine objective 1, hierarchical regression analyses were conducted. The independent variables were entered in separate blocks: demographics; (family) cancer diagnosis and perceived health; television and internet exposure; cancer knowledge.

To determine objective 2a, an interaction term was added to the regression model. Next, to test objective 2b, the PROCESS script of Hayes²² was used. This is a regression-based tool used for path analysis-based mediation analysis.²² Direct and indirect pathways are generated through this script. The unstandardized regression coefficients for indirect effects are calculated through a bootstrapping process, determining 95% confidence intervals.

Finally, objective 3 was tested. To determine whether the regression model of media exposure, cancer knowledge and lifestyle choices was moderated by having had a cancer diagnosis or not, interaction terms were added to this regression model. To test whether the mediation and moderation analyses differed for these two subsamples, the PROCESS script of Hayes was used.²²

All analyses were calculated with the use of the Statistical Package for Social Sciences (version 22, SPSS Inc., Chicago, IL, USA).

Results

Sample

In total, 2008 respondents completed the survey. Seventy per cent of this sample was female. Respondents' ages ranged from 16 to 88 years ($M=43.4$, $SD=16.6$). Six per cent was 20 years old or younger, 75.6% were between 21 and 60 years old, and 18.3% was 61 and older. The descriptive information is presented in [table 1](#).

Comparing these sample characteristics with the Belgian population,²³ an overrepresentation of women (70.4% of the respondents compared with 50.9% in the population) and higher educated individuals (47.1% of the respondents compared with 28.1% in the population) could be observed. The ages of the respondents were relatively consistent with the distribution in the Belgian population (20.3% is younger than 18 year, 61.8% is between 18 and 64 and 17.9% is 65 years old or higher).²³

Cancer knowledge index

In the total sample, 50.9% of the respondents scored at least 4 out of 6 on this index. The question with the largest number of incorrect answers was 'How many servings of fruits and vegetables do you think a person should eat each day for good health?'. The answers on the cancer knowledge index are presented in [Supplementary table S1](#).

Lifestyle choices index

Twenty-one per cent of the total sample scored 5 out of 5 on this index, 30.5% had a score of 4 out of 5, 28.3% a score of 3 and 19.7% scored 2 or less. The percentages of less healthier lifestyle choices on each item of this index could be found in [Supplementary table S2](#).

Exposure to television and internet

Respondents watched an average of 11:56 h of television ($SD=8:40$) per week and were active on the internet for 12:05 h ($SD=10:51$) per week.

The relationship between media exposure, cancer knowledge and lifestyle choices

In order to investigate whether media use on the one hand, and cancer knowledge on the other hand were predictors of lifestyle choices (objective 1), hierarchical regression analyses were conducted ([table 2](#)). It was controlled whether multicollinearity was a problem by investigating the correlation matrix and the variance inflation factors of the predictors in the regression model. These results generated no indications for multicollinearity. Missing values were handled as system-missing values, and in the analyses these missings were listwise deleted. Univariate outliers were identified by examining the boxplots of the used variables, and were manually removed. Furthermore, multivariate outliers were

Table 1 Means, standard deviations and independent samples T-tests of the total sample and the stratified samples

	Total sample			Non-diagnosed individuals		Cancer-diagnosed individuals		Independent samples t-tests
	N	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	P value
Age (in years)	1983	43.4	16.6	38.8	16.0	54.0	12.4	<0.001
Degree (scores from 0 (low) to 4 (high))	2003	3.6	1.1	3.7	1.1	3.3	1.1	<0.001
Health perception (scores from 0 (low) to 4 (high))	2000	2.0	0.9	2.2	0.8	1.6	0.8	<0.001
Weekly television exposure (in hours)	1896	11:56	8.40	10:35	07:57	14:55	09:26	<0.001
Weekly Internet exposure (in hours)	1967	12:05	10:51	13:21	11:19	09:10	09:03	<0.001
Cancer knowledge index (scores from 0 (low) to 6 (high))	1957	3.5	1.5	3.5	1.5	3.4	1.5	0.017
Lifestyle choices index (scores from 0 (low) to 5 (high))	1941	3.5	1.1	3.5	1.1	3.5	1.1	0.245

Note: N=2008. Survey data were collected from May 2012 until January 2013 in Flanders (Belgium).

Table 2 Hierarchical regression analyses: predictors of lifestyle choices index

	Total sample		
	β	P value	ΔR^2
Demographics			3.6%
Gender (0= male, 1= female)	0.10	<0.001	
Age (1-year increase)	0.10	<0.001	
Degree (1-unit increase)	0.04	0.137	
Experience cancer and health perception			2.2%
Cancer diagnosis or not (0= non-diagnosed, 1= diagnosed)	0.06	0.026	
Cancer direct family (0= no family history, 1= family history)	0.00	0.889	
Health perception (one-unit increase)	0.14	<0.001	
Media exposure			0.8%
Weekly television exposure (1-h increase)	-0.08	0.002	
Weekly internet exposure (1-h increase)	-0.02	0.325	
Cancer knowledge			2.5%
Cancer knowledge index (one-unit increase)	0.17	<0.001	

Note: N=1746. Standardized regression coefficients (betas) are used for all blocks.

identified using Cook's distance measure. In total, 217 outliers were identified. Analyses were conducted with and without univariate and multivariate outliers, but as these did not influence the relationships, the results reported include these outliers.

The regression model showed that being female, being older, and having had a cancer diagnosis were all positively associated with healthier lifestyle choices. However, degree and indirect experience with cancer were not significant determinants. Health perception was a strong, positive determinant, indicating that individuals who rated their health to be better, made better lifestyle choices. Television exposure was negatively related to lifestyle choices, indicating that if television exposure per week increases, the score on the lifestyle index decreases. Internet exposure was not a significant predictor. Finally, cancer knowledge was a positive determinant of lifestyle choices. All blocks added significantly to the model. The final regression model explained 9% ($P < 0.001$) of the variance of the lifestyle choices index.

In a next step of the analyses, it was tested whether cancer knowledge was a moderator and/or mediator in the relationship between television exposure and lifestyle choices. Because internet use was not a significant predictor of lifestyle choices, this was only tested in the relationship between television exposure and lifestyle choices index. To test whether cancer knowledge was a moderator (objective 2a), an interaction term between television exposure and cancer knowledge was added in the regression model. There was no significant interaction effect of cancer knowledge between television exposure and lifestyle choices ($\beta = 0.02$, $P = 0.29$). Next, the output

of the mediation model of the Hayes script (objective 2b) showed that television viewing was a negative predictor of cancer knowledge, and cancer knowledge was a positive predictor of lifestyle choices (figure 1).

This output applies unstandardized coefficients (table 3). The direct effect of daily television exposure on lifestyle choices was -0.09 ($P < 0.001$). This indicates that 1 h of additional television viewing per day elicits a direct decrease of 0.09 on the lifestyle choices index. The indirect effect of daily television exposure on lifestyle choices, through cancer knowledge was -0.01 (95% CI -0.021 ; -0.004). This indicates that 1 h of additional television viewing each day elicits an indirect decrease of 0.01 on the lifestyle choices index.

In the final step, it was investigated whether the previous two objectives differed for cancer diagnosed and non-diagnosed individuals (objective 3). In order to test whether the regression model was moderated by having had a cancer diagnosis or not, interaction terms between television exposure and having had cancer ($\beta = -0.03$, $P = 0.413$), and between internet exposure and having had cancer ($\beta = 0.00$, $P = 0.951$) on the one hand, and between cancer knowledge and having had cancer on the other hand ($\beta = 0.01$, $P = 0.854$) were added to this regression model. These interaction terms were not significant, indicating no differences in the two subsamples for this model. Finally, it was investigated whether the investigated mediation effect differed for the subsamples. This Hayes moderated mediation model²² showed that this mediation effect between television exposure and lifestyle choices ($\beta = -0.03$, $P = 0.487$), through television exposure and cancer knowledge ($\beta = 0.02$, $P = 0.541$) and through cancer knowledge and lifestyle choices ($\beta = -0.05$, $P = 0.396$) was not moderated by having had a cancer diagnosis or not.

Discussion

Previous research already indicated that higher television exposure was linked with less healthy behaviours,³⁻⁶ and that knowledge could be an important predictor of healthy behaviours.⁸⁻¹¹ This study wanted to extend this line of research by examining the complex relationship between media use and lifestyle choices and the role of cancer knowledge.

In line with previous studies,³⁻⁶ television exposure was a negative predictor of healthy lifestyle choices (objective 1). Also cancer knowledge appeared to be a strong, positive predictor of lifestyle choices, which was also consistent with previous research that studied cancer knowledge and screening behaviour.⁸⁻¹¹ Because of the high amount of cancer and health information on the internet and the popularity of the internet for health information, it was expected that the internet too would predict lifestyle choices, but this was not the case. A possible explanation could be that individuals use the internet more actively to look for health and cancer information, while television is less intentionally used. The

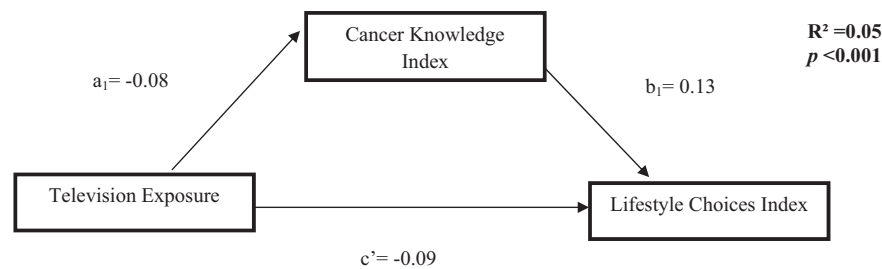


Figure 1 Mediation model of television exposure and lifestyle choices index

Table 3 Output of the mediation analyses

Indirect Effect	Unstandardized Beta	Bootstrap SE	Bootstrap 95% LLCI	Bootstrap 95% UICI
a_1b_1	−0.01	0.00	−0.021	−0.004
Direct Effect	Unstandardized Beta	SE	P value	# Bootstrap samples = 1000
c'	−0.09	0.02	<0.001	

Note: N = 1778. Control variables: gender, age, degree.

narrative structure of health information on television might reduce counterarguing, which may enhance persuasive effects.²⁴ In other words, the engaging content of television might ‘preclude cognitive resistance’²⁴ to health message and might as such have a bigger effect on health perceptions and behaviour.

Next, this study did not find a moderation effect of cancer knowledge in the relationship between television exposure and lifestyle choices (objective 2a). Thus, the relationship between television exposure and lifestyle behaviour did not vary as a function of respondents cancer knowledge. However, cancer knowledge appeared to be a mediator in the relationship between daily television exposure and lifestyle choices (objective 2b). This mediation effect means that individuals who watched more television, had a lower cancer knowledge and scored lower on the lifestyle choices index. One possible explanation for this negative relationship between television exposure and cancer knowledge could be that not all television content concerning cancer is correct. Storylines are often dramatized on television programs. Earlier research found that 70% of all health oriented television program content was inaccurate or even misleading.²⁵

In this study, no differences in the multivariate relationships were found for the two subsamples (objective 3). The results of this study indicated that television exposure was negatively related to, and cancer knowledge was positively associated with lifestyle choices for both cancer diagnosed and non-diagnosed individuals. Also, for both these subsamples there was a direct relationship between television exposure and lifestyle choices, and an indirect relationship through cancer knowledge. This seems somewhat counterintuitive, since these two groups probably are likely to have different experiences with cancer.

Based on the regression analyses, and in line with previous empirical research on the effects of television viewing on health outcomes,⁶ it could be argued that television exposure was only a small negative predictor of lifestyle choices. This means that a large increase in television hours is necessary to decrease the lifestyle choices index. However, as several studies argued, small effects are common in media-effects research.^{26,27} Moreover, it is likely that these small effects are cumulatively relevant.²⁸ In their daily life these respondents are not occasionally, but continuously exposed

to television. In that sense the problems of measuring television viewing are similar to the problems of measuring lifetime smoking behaviour (cf. pack-years estimates). Also, in the regression model, television exposure remains a significant predictor even after controlling for several variables.

This study may have practical implications. Health practitioners and policy and campaign developers should be aware of the negative association between television exposure and cancer knowledge on the one hand, and of the negative relationship between television exposure and lifestyle choices on the other hand. Attempting to offer more or better cancer knowledge through television might be an avenue worth pursuing to moderate the negative relationship we found. What is known as entertainment education may be a path worth exploring. This is television content that both educates and entertains (e.g. a storyline in a soap opera about a character that gets cancer). Several studies have shown promising results of entertainment education with cancer storylines and increasing knowledge, attitudes and intentional screening behaviour.^{29–31}

Limitations

This study has several limitations. Its cross-sectional nature does not permit making causal generalizations. Furthermore, the two subsamples were representative neither for the entire Flemish population nor for cancer diagnosed or non-diagnosed individuals. However, because this study investigates differences between these two groups, there are no indications that these differences are biased. This study used a convenience sample, which resulted in an observable overrepresentation of women and higher educated individuals²³ and possible, but unidentified, other forms of selection bias. It must also be acknowledged that individuals who were willing to participate might be more health conscious or more preoccupied by cancer. In addition, the L-CIS was based on self-reports. While this technique of self-reporting is used regularly in social sciences research on health and communication issues, health behaviour self-reports and an individual survey form could lead to self-report and recall bias.³² Finally, this study controlled for a predicting number of potential confounding variables, but it is likely that there are several other factors that could have influenced lifestyle choices. Future research should address these shortcomings and should further investigate these associations.

Supplementary data

Supplementary data are available at *EURPUB* online.

Acknowledgements

The authors like to thank all the respondents who were willing to fill out the questionnaire. Furthermore, the authors would like to thank the reviewers for their helpful suggestions that improved the manuscript substantially. The funding source had no involvement

in the selection of respondents, questionnaire design, item selection, analyses, conclusions or writing of the text.

Funding

This research was funded by the Research Foundation—Flanders (Grant No. G0A4212N).

Conflicts of interest: None declared.

Key points

- Cancer information is widely available in the mass media nowadays.
- Television exposure was negatively related with both lifestyle choices and cancer knowledge, while cancer knowledge was positively related with lifestyle choices.
- Cancer knowledge was a mediating variable between television exposure and lifestyle choices.
- These results did not differ for cancer diagnosed individuals and non-diagnosed individuals.
- Those dealing with cancer prevention and health promotion should be aware of the potential negative influence of television and of the potential positive influence of cancer knowledge on lifestyle choices.

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